Coordinate Geometry

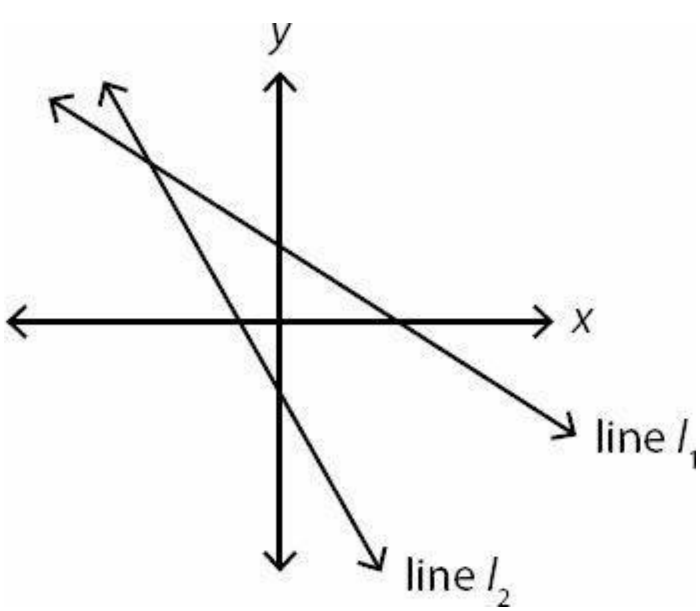
For questions in the Quantitative Comparison format ("Quantity A" and "Quantity B" given), the answer choices are always as follows:

(A) Quantity A is greater.
(B) Quantity B is greater.
(C) The two quantities are equal.
(D) The relationship cannot be determined from the information given.

For questions followed by a numeric entry box $\boxed{}$, you are to enter your own answer in the box. For questions followed by fraction-style numeric entry boxes $\dfrac{\boxed{}}{\boxed{}}$, you are to enter your answer in the form of a fraction. You are not required to reduce fractions. For example, if the answer is 1/4, you may enter 25/100 or any equivalent fraction.

All numbers used are real numbers. All figures are assumed to lie in a plane unless otherwise indicated. Geometric figures are not necessarily drawn to scale. You should assume, however, that lines that appear to be straight are actually straight, points on a line are in the order shown, and all geometric objects are in the relative positions shown. Coordinate systems, such as *xy*-planes and number lines, as well as graphical data presentations such as bar charts, circle graphs, and line graphs, *are* drawn to scale. A symbol that appears more than once in a question has the same meaning throughout the question.

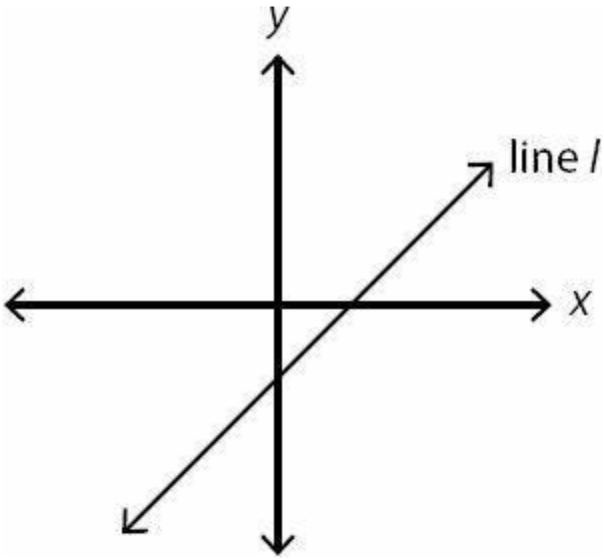
1.



Quantity A | **Quantity B**

The slope of line l_1 The slope of line l_2

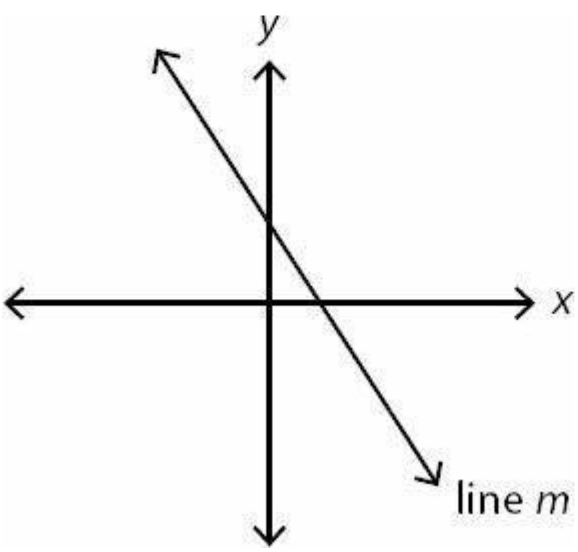
2.



W hich of the follow ing is m ost likely to be the equation of line *l*?

(A) $y = 4x + 4$
(B) $y = 4x - 4$
(C) $y = x - 6$
(D) $y = x + 1/2$
(E) $y = -x - 3$

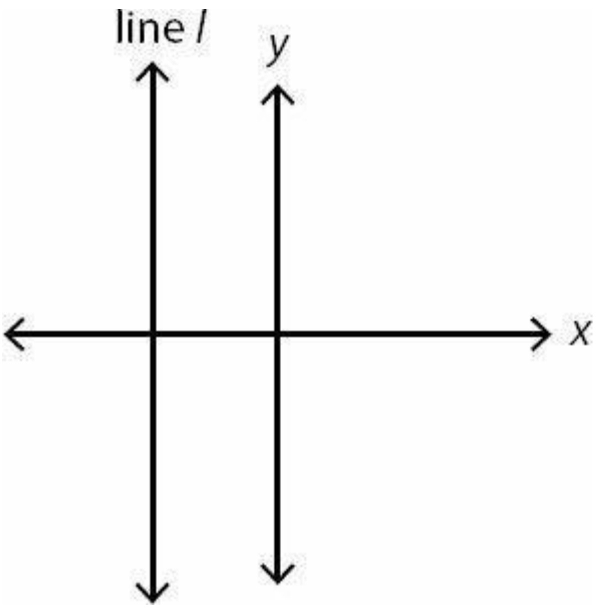
3.



W hich of the follow ing could be the equation of line *m* ?

(A) $6y + 6x = 7$
(B) $3y = -4x - 3$
(C) $5y + 10 = -$
$4x$ (D) $y = 2$
(E) $x = -2$

4.



If line *l* is parallel to the *y*-axis,w hat could be the equation of line *l*?

(A) $x = 2$
(B) $x = -2$
(C) $y = 2$
(D) $y = -2$
(E) $y = -2x$

5.W hat is the equation of the line that passes through (-1,-3) and has a slope of -2?

(A) $y = -2x - 1$
(B) $y = -2x - 2$
(C) $y = -2x - 5$
(D) $y = -4x -2$
(E) $y = -5x + 2$

6.W hat is the slope of a line that passes through the points (-4,5) and (1,2)?

(A) $-\frac{3}{5}$

(B) -1

(C) $-\frac{5}{3}$

(D) $-\frac{7}{3}$

(E) -3

7.W hich of the follow ing could be the slope of a line that passes through the point (-2,-3) and crosses the *y*-axis above the origin?

Indicate all such values.

- ☐ $-\frac{2}{3}$
- ☐ $\frac{3}{7}$
- ☐ $\frac{3}{2}$
- ☐ $\frac{5}{3}$
- ☐ $\frac{9}{4}$
- ☐ 4

8.If a line has slope -2 and passes through the points (4,9) and (6,*y*),w hat is the value of *y*?

☐

9.W hat is the distance betw een the points (-1,-1) and (5,6)?

(A) 6
(B) 7
(C) $\sqrt{79}$
(D) $\sqrt{85}$
(E) 11

10.If the longest distance betw een any tw o of the points (-1,-2),(6,-2),and (7,10) is $p\sqrt{13}$,w hat is the value of *p*?

☐

11.

A line has the equation 2*y* - 4*x* - 8 = 0.

Q uantity A	**Q uantity B**
The slope of the line	4

12.W hich of the follow ing points lies on the line *y* = 2*x* - 8?

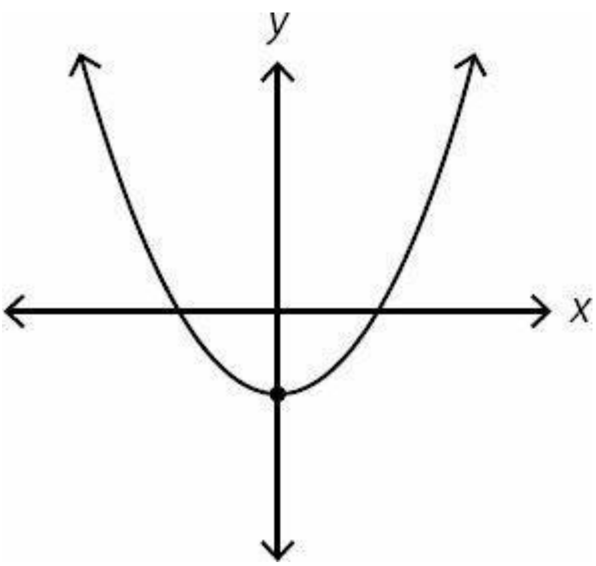
Indicate <u>all</u> such values.

- ☐ (3,-2)
- ☐ (-8,0)
- ☐ (1/2,-7)

13.W hich of the follow ing points does N O T lie on the curve $y = x^2 - 3$?

(A) (3,6)
(B) (-3,6)
(C) (0,-3)
(D) (-3,0)
(E) (0.5,-2.75)

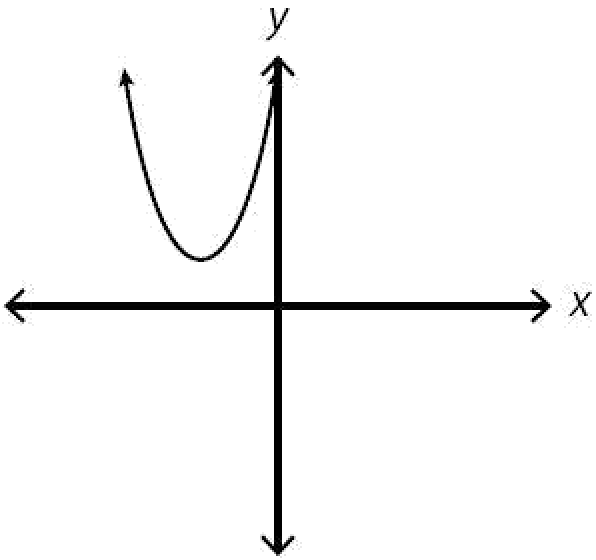
14.



W hich of the follow ing could be the equation of the figure above?

(A) $y = x - 2$
(B) $y = x^2 - x$
(C) $y = x^2 - 2$
(D) $y^2 = x^2$
(E) $y = x^3 - 2$

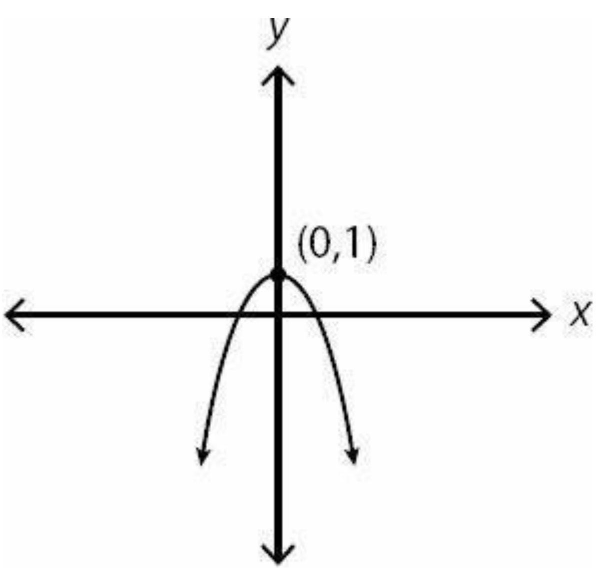
15.



W hich of the follow ing could be the equation of the parabola pictured above?

(A) $y = x^2 + 3$
(B) $y = (x - 3)^2 + 3$
(C) $y = (x + 3)^2 - 3$
(D) $y = (x - 3)^2 - 3$
(E) $y = (x + 3)^2 + 3$

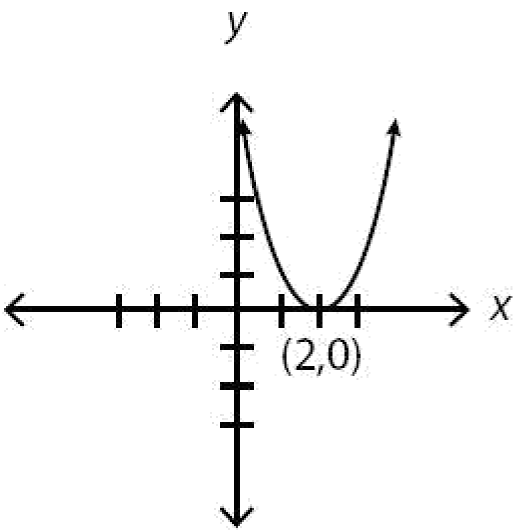
16.



W hich of the follow ing could be the equation of the parabola pictured above?

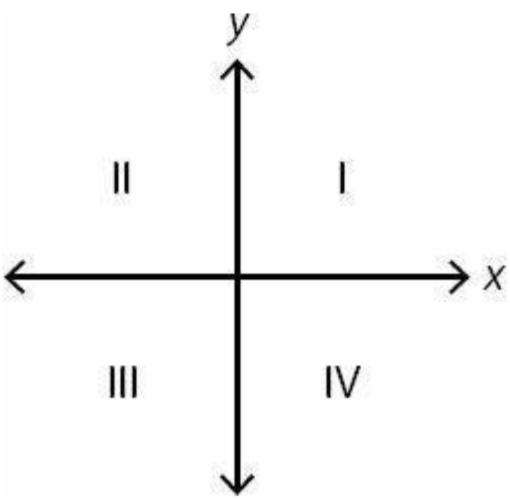
(A) $y = -x - 1$
(B) $y = x^2 + 1$
(C) $y = -x^2 - 1$
(D) $y = -x^2 + 1$
(E) $y = -(x - 1)^2$

17.



If the equation of the parabola pictured above is $y = (x - h)^2 + k$ and (-3,n) is a point on the parabola,w hat is the value of n?

18.



W hich quadrant,if any,contains no point (x,y) that satisfies the inequality $y \geq (x - 3)^2 - 1$?

(A) I
(B) II
(C) III
(D) IV
(E) A ll quadrants contain at least one point that satisfies the given inequality.

19.

In the coordinate plane,line p has an equation of $3y - 9x = 9$.

Q uantity A	**Q uantity B**

The slope of line *p*	The *x*-intercept of line *p*

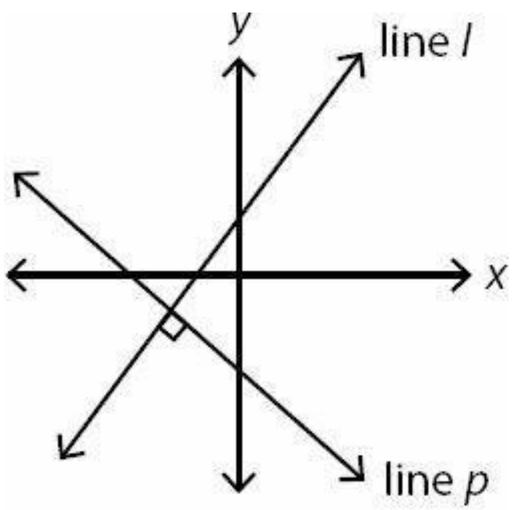
20.In the *xy* coordinate plane,lines l_1 and l_2 intersect at (2,4).If the equation of l_1 is $y = px + 16$ and the equation of l_2 is $y = mx + p$,w here *m* and *p* are constants,w hat is the value of *m* ?

21.If (3,5) and (4,9) are points on line *L*,w hich of the follow ing is also a point on that line?

Indicate <u>all</u> such values.

- ☐ (2,1)
- ☐ (5,12)
- ☐ (6,17)

22.



Line *l* has slope > 1.

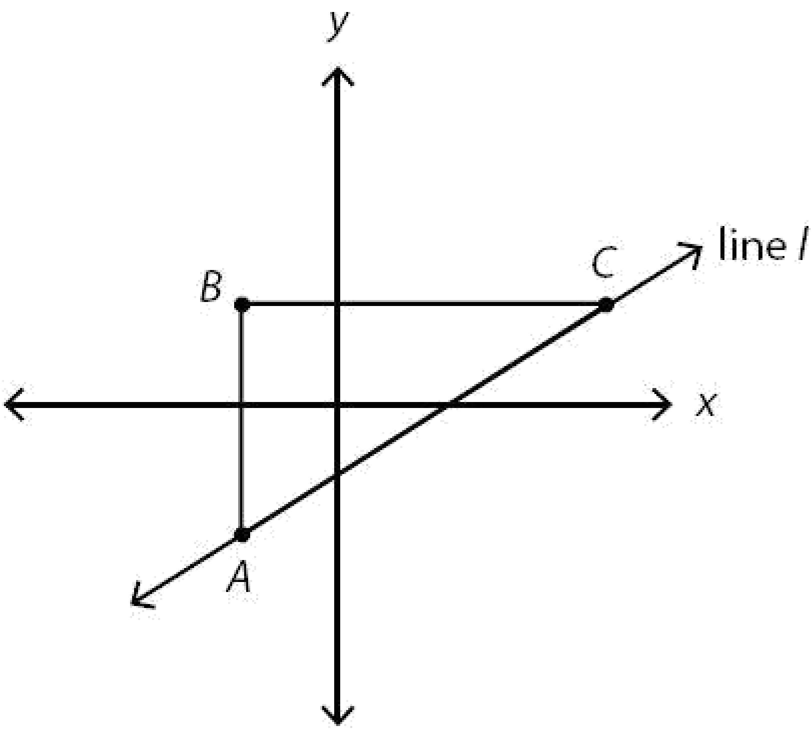
<u>Q uantity A</u>	**<u>Q uantity B</u>**
Slope of line *p*	-1

23.

Lines l_1 and l_2 are parallel and have slopes that sum to less than 1.

<u>Q uantity A</u>	**<u>Q uantity B</u>**
The slope of a line perpendicular to lines l_1 and l_2	$-\frac{1}{2}$

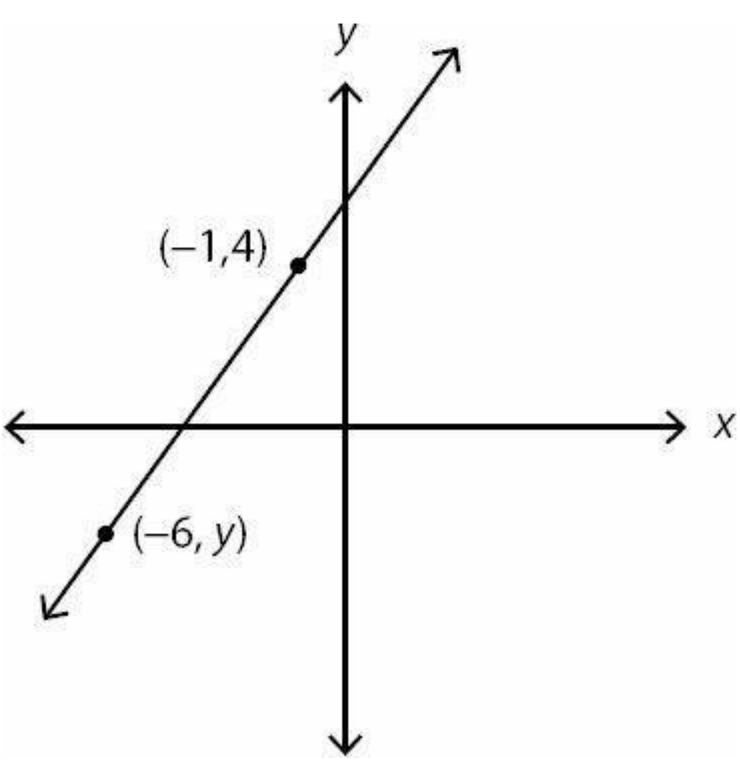
24.



If the slope of line *l* is 1/3 and the length of line segm ent *BC* is 4,how long is line segm ent *AB* ?

(A) 3/4
(B) 4/3
(C) 3
(D) 4
(E) 12

25.



If the slope of the line is $\frac{15}{14}$,w hat is the value of *y*?

(A) $\frac{2}{7}$

(B) $\frac{7}{2}$

(C) $-\frac{7}{2}$

(D) $-\frac{14}{19}$

(E) $-\frac{19}{14}$

26.W hat is the area of a triangle w ith vertices (-2,4),(2,4) and (-6,6)?

27.

Lines *k* and *p* are perpendicular,neither is vertical,and *p* passes through the origin.

Q uantity A	**Q uantity B**
The product of the slopes of lines *k* and *p*	The product of the *y*-intercepts of lines *k* and *p*

28.

In the coordinate plane,points (*a*,*b*) and (*c*,*d*) are equidistant from the origin. $|a| > |c|$

Q uantity A	**Q uantity B**
$\lvert b\rvert$	$\lvert d\rvert$

29.

In the coordinate plane,lines *j* and *k* are parallel.The *x*-intercept of line *j* is greater than that of line *k* and the product of their slopes is positive.

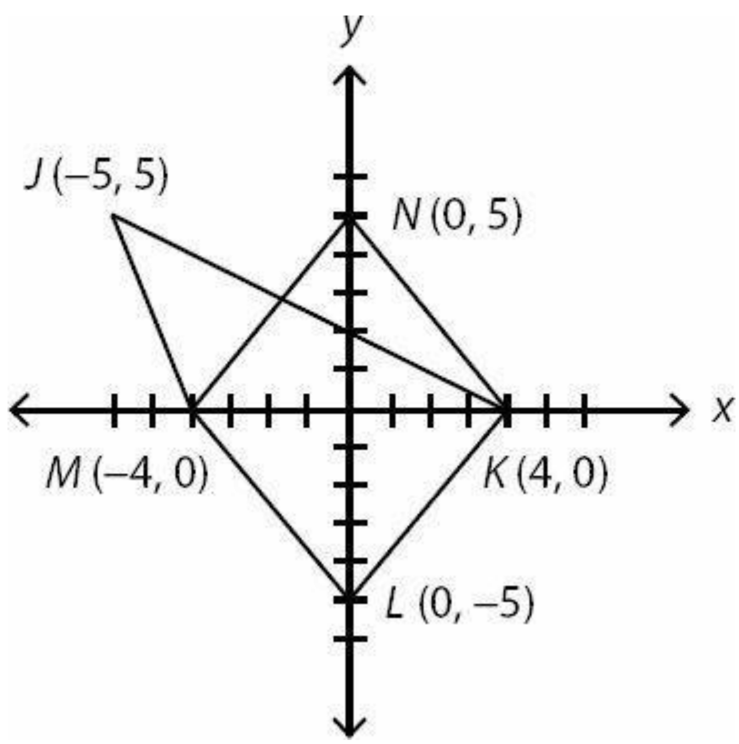
Q uantity A	**Q uantity B**
The *y*-intercept of line *j*	The *y*-intercept of line *k*

30.In the *xy* plane,w hich of the statem ents below individually provide enough inform ation to determ ine w hether line *z* passes through the origin?

Indicate <u>all</u> such statem ents.

- ☐ The equation of line z is $y = m\,x + b$ and $b = 0$.
- ☐ The sum of the slope and the y-intercept of line z is 0.
- ☐ For any point (a,b) on line z, $|a| = |b|$.

31.



Q uantity A	**Q uantity B**
The area of parallelogram *K LM N*	The area of quadrilateral *JK LM*

32.W hich of the follow ing could be the equation of a line parallel to the line $5x - 6y = 9$?

(A) $y = -\frac{5}{6}x + 1$

(B) $y = \frac{6}{5}x + 1$

(C) $y = \frac{5}{6}x + 1$

(D) $y = \frac{3}{2}x - 1$

(E) $y = \frac{2}{3}x - 1$

33.W hich of the follow ing could be the equation of a line perpendicular to the line $y = -6x + 4$?

(A) $6y - x = 12$

(B) $x = -6y - 12$

(C) $y + 4x = 2$

(D) $\frac{y}{2} = -3x + 5$

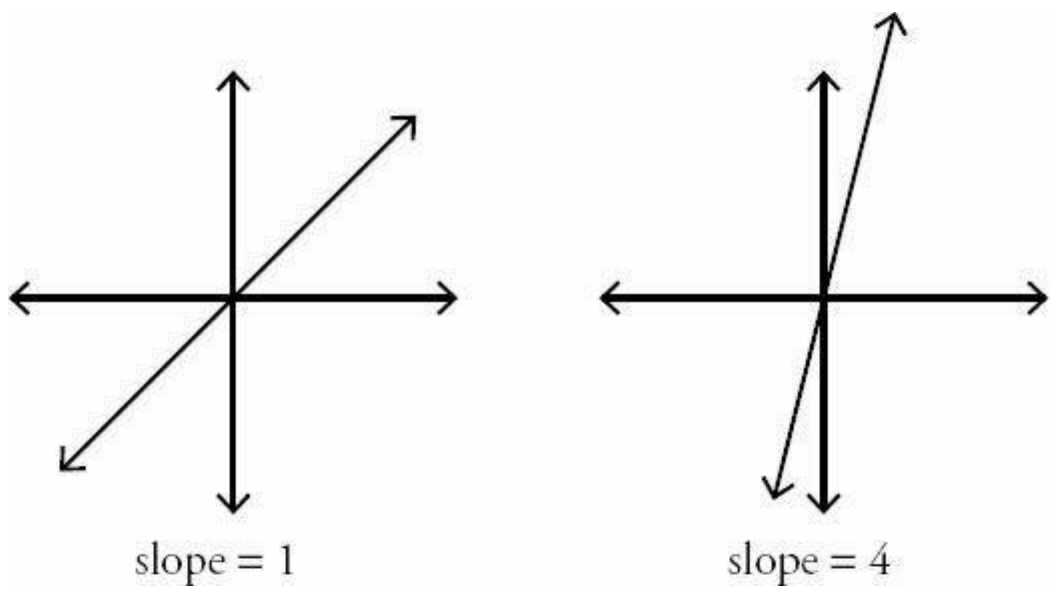
(E) $y + 1 = 6x$

Coordinate Geometry Answers

1. **(A).** Both slopes are negative (pointing down when reading from left to right), and line l_2 is clearly steeper than line l_1. Thus, the slope of l_2 has a larger *absolute value*. But since the values are both negative, the slope of l_1 is a larger number. For instance, the slope of l_1 could be -1 and the slope of l_2 could be -2. Whatever the actual numbers are, the slope of l_1 is closer to 0 and therefore larger.

2. **(C).** Since there are no numbers on the graph, you can't determine the actual equation of the line, but the line clearly has a positive slope (it points upward when reading from left to right) and a negative *y*-intercept (it crosses the *y*-axis below the origin). All of the answers are already in slope-intercept form ($y = mx + b$ where m = slope and b = *y*-intercept). Choices (A), (B), (C), and (D) have positive slope. Of those, only choices (B) and (C) have a negative *y*-intercept.

Now, is the slope closer to positive 4 or positive 1? A slope of 1 makes 45° angles when it cuts through the *x* and *y* axes, and this figure looks very much like it represents a slope of 1. A slope of 4 would look much steeper than this picture. Note that *xy*-planes are drawn to scale on the GRE, and units on the *x*-axis and on the *y*-axis are the same, unless otherwise noted.



The correct answer is (C). Note that the GRE would only give questions like this where the answers are far enough apart that you can clearly determine the intended answer.

3. **(A).** Since there are no numbers on the graph, you can't determine the actual equation of the line, but the line clearly has a negative slope (it points down when reading from left to right) and a positive *y*-intercept (it crosses the *y*-axis above the origin).

Change the answers to slope-intercept form ($y = mx + b$ where m = slope and b = *y*-intercept). First note that (D) and (E) cannot be the answers— choice (D) represents a horizontal line crossing through (0,2), and choice (E) represents a vertical line passing through (-2,0). Now, look at choice (A):

$$6y + 6x = 7$$

$6y = -6x + 7$

$y = -x + \frac{7}{6}$

This line (choice A) has slope -1 and *y*-intercept $\frac{7}{6}$. N ext,test choice (B):

$3y = -4x - 3$

$y = -\frac{4}{3}x - 1$

This line (choice B) has slope $-\frac{4}{3}$ and *y*-intercept.Finally,look at (C):

$5y + 10 = -4x$
$5y = -4x - 10$

$y = -\frac{4}{5}x - 2$

This line (choice C) has slope $-\frac{4}{5}$ and *y*-intercept -2.

The only choice w ith a negative slope and a positive *y*-intercept is choice (A).

4.**(B).**Since the line is vertical,it alw ays has the sam e *x*-coordinate.That is w hat the correct answ er,*x* = -2, expresses.N o m atter w hat the *y*-coordinate is,*x* is alw ays som e negative value.A ll equations of vertical lines have the form *x* = [num ber].Sim ilarly,all equations of horizontal lines have the form *y* = [num ber].

5.**(C).**In *y* = *m x* + *b* form ,*m* is the slope and *b* is the *y*-intercept.Since the slope is -2:

$y = -2x + b$

N ow ,plug in the point (-1,-3) to determ ine *b*:

$-3 = -2(-1) +$
b $-3 = 2 + b$
$-5 = b$

Since *b* = -5,the equation of the line is:

$y = -2x - 5$

N ote that the coordinates (-1,-3) do not belong in the final answ er.The point (-1,-3) w as m erely an exam ple of one of the infinite num ber of points along the line.

6.**(A).**The slope form ula is $m = \frac{y_2 - y_1}{x_2 - x_1}$.It doesn’t m atter w hich point is first;just be consistent.U sing (-4,5) as x_1 and y_1 and (1,2) as x_2 and y_2:

$$m = \frac{2-5}{1-(-4)} = -\frac{3}{5}$$

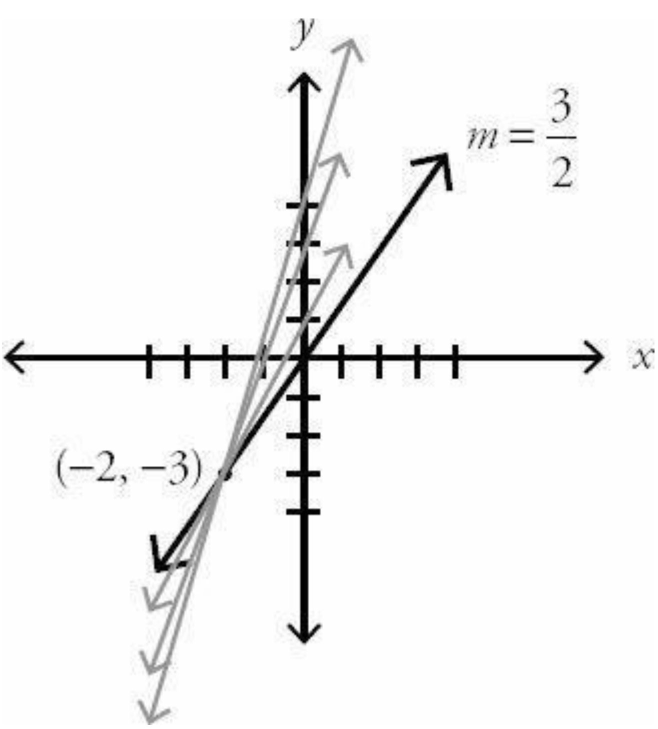
The slope is $\frac{-3}{5}$,w hich appears in the choices as $-\frac{3}{5}$ (these are identical).

7.**IV ,V ,and V I only.**The line m ust hit a point on the *y*-axis above (0,0).That m eans the line could include (0,0.1), (0,25),or even (0,0.00000001).Since the *x*-intercept could get very,very close to (0,0),use the point (0,0) to calculate the slope— and then reason that since the line can’t *actually* go through (0,0),the slope w ill actually have to be steeper than that.

The slope form ula is $m = \frac{y_2 - y_1}{x_2 - x_1}$.U sing (0,0) as x_1 and y_1 and (-2,-3) as x_2 and y_2 (you can m ake either pair of points x_1 and y_1,so m ake w hatever choice is m ost convenient):

$$m = \frac{-3-0}{-2-0} = \frac{-3}{-2} = \frac{3}{2}$$

Since the slope is positive and the line referenced in the problem needs to hit the *x*-axis above (0,0),the slope of that line w ill have to be greater than $\frac{3}{2}$,as in the gray lines below :



Select all answ ers w ith a slope greater than $\frac{3}{2}$.Thus, $\frac{5}{3}$, $\frac{9}{4}$, ,and 4 are correct.

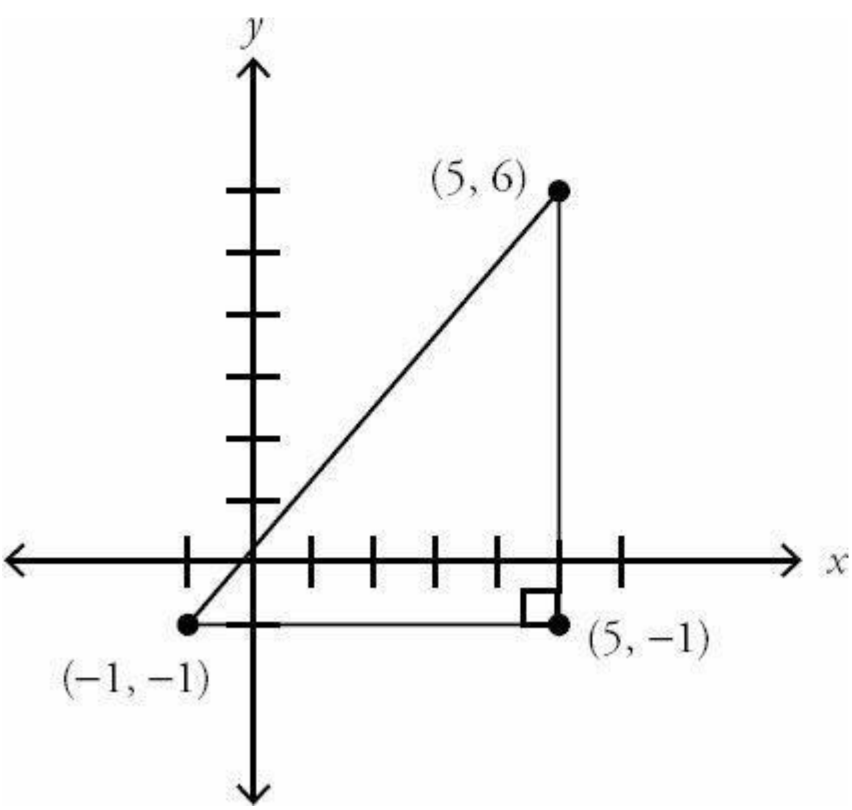
8.**5.**The slope form ula is $m = \frac{y_2 - y_1}{x_2 - x_1}$.U sing (4,9) as x_1 and y_1 and (6,*y*) as x_2 and y_2,and plugging in -2 for the slope:

-2 = $\frac{y-9}{6-4}$
-2 = $\frac{y-9}{2}$
-4 = *y* = -
9 5 = *y*

9.**(D).**Y ou could use the distance form ula,*d* = $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$:

d = $\sqrt{(6-(-1))^2 + (5-(-1))^2}$
d = $\sqrt{(7)^2 + (6)^2}$
d = $\sqrt{85}$

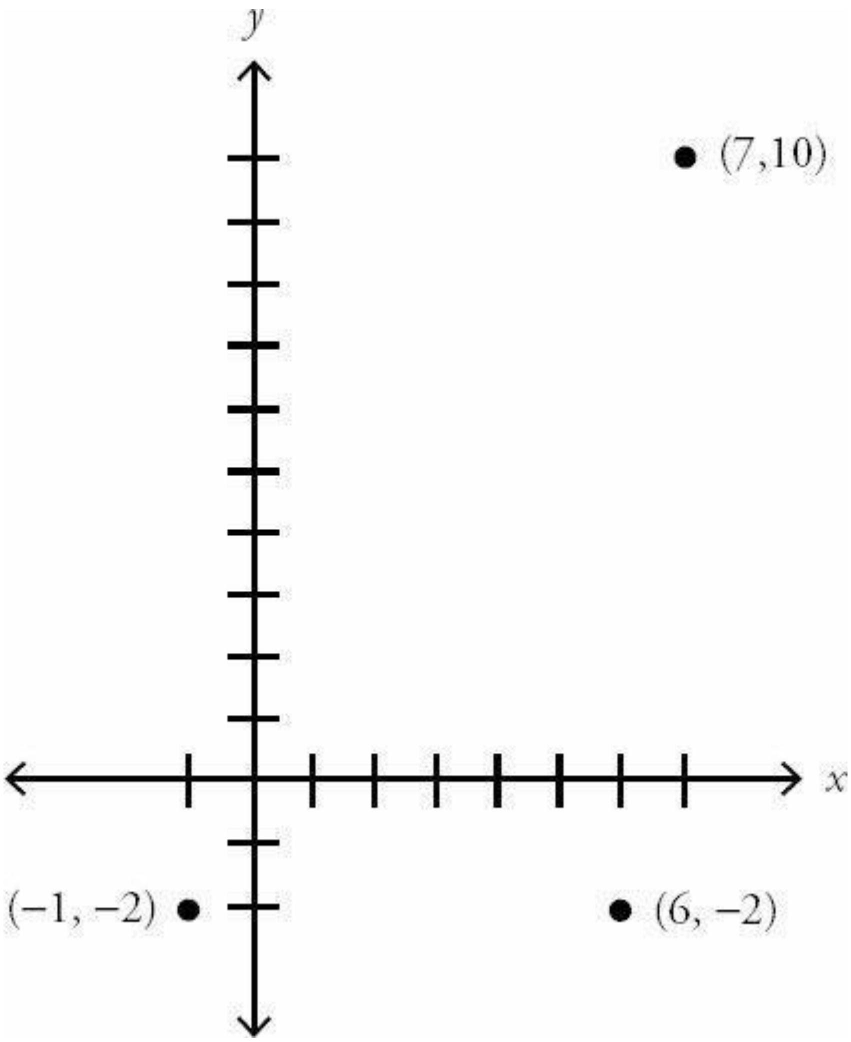
O r you could construct a right triangle and use the Pythagorean theorem :



The third point,(5,-1) lets you construct a right triangle w ith the distance *d* as the hypotenuse.The distance betw een (-1,-1) and (5,-1) is 6.The distance betw een (5,-1) and (5,6) is 7.From the Pythagorean theorem :

$6^2 + 7^2 = d^2$
$36 + 49 = d^2$
$85 = d^2$ d
$= \sqrt{85}$

10.**4.**M ake a quick sketch:



It should be obvious that the tw o furthest points are (-1,-2) and (7,10).A lso keep in m ind that since (-1,-2) and (6,-2) share a *y*-coordinate,the distance betw een the tw o points is just the distance betw een their *x*-coordinates: 6 - (-1) = 7.The correct answ er should definitely be longer than 7.

To find the distance betw een (-1,-2) and (7,10),you could use the distance form ula:

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
$d = \sqrt{(10 - (-2))^2 + (7 - (-1))^2}$
$d = \sqrt{(12)^2 + (8)^2}$

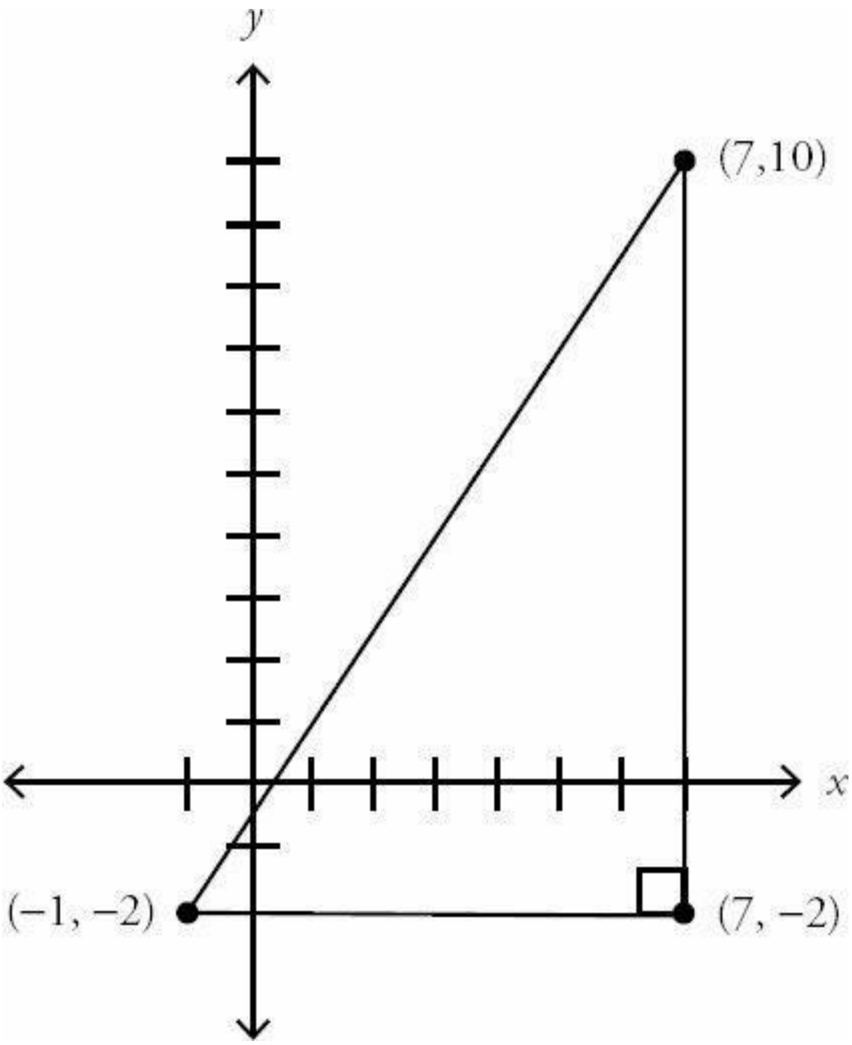
$d = \sqrt{208}$

U se your calculator,if needed,to find the biggest perfect square that goes into 208.It is 16:

$d = \sqrt{208} = \sqrt{16 \times 13} = 4\sqrt{13}$

Since the distance $p\sqrt{13}$ is equal to $4\sqrt{13}$,$p = 4$.

A lternatively,you could construct a right triangle and use the Pythagorean theorem .



The point (7,-2) lets you construct a right triangle w ith the distance *d* as the hypotenuse.(D on't get confused— this point has nothing to do w ith the (6,-2) from the problem ;that point w as irrelevant to the question being asked.) Y ou create the point (7,-2) by dropping a line straight dow n from (7,10) and stopping at (7,-2),w hich has the sam e *y*-coordinate as the point (-1,-2).

The distance betw een (-1,-2) and (7,-2) is 8.The distance betw een (7,10) and (7,-2) is 12.From the Pythagorean Theorem :

$8^2 + 12^2 = d^2$
$64 + 144 = d^2$

$208 = d^2$
$d = \sqrt{208} = \sqrt{16 \times 13} = 4\sqrt{13}$

A gain,since the distance $p\sqrt{13}$ is equal to $4\sqrt{13}$,p = 4.

11.**(B).**M anipulate 2y - 4x- 8 = 0 into slope intercept form ($y = mx + b$,w here m is the slope and b is the y-intercept):

$2y - 4x = 8$
$2y = 4x + 8$
$y = 2x + 4$

The slope of the line is 2.(The y-intercept is 4,w hich m ay be the “trick” intended in Q uantity B).Q uantity B is larger.

12.**I and III only.**For the point (3,-2) to lie on the line $y = 2x - 8$,y needs to equal -2 w hen you plug in 3 for x.

$y = 2(3) - 8$ y
$= 6 - 8 = -2$

y does equal -2 w hen x equals 3,so the point does lie on the line and statem ent I is correct.

H ow ever,w hen you plug in -8 for x,y does not equal 0,so statem ent II is not correct.W hen you plug in 1/2 for x,y does equal -7,so statem ent III is correct.

13.**(D).**The problem asks for the point that does N O T lie on the curve.$y = x^2 - 3$ is the equation of a parabola,but you don’t need to know that fact in order to answ er this question.For each choice,just plug in the coordinates for x and y. For instance,try choice (A):

$6 = (3)^2 - 3$
$6 = 6$

Since this is a true statem ent,choice (A) lies on the curve.The only choice that yields a false statem ent w hen plugged in is choice (D),the correct answ er.

For the point (-3,0) to lie on the curve $y = x^2 - 3$,y needs to equal 0 w hen you plug in -3 for x.

$y = (-3)^2 - 3$
$y = 9 - 3 = 6$

y does not equal 0 w hen x equals -3,so the point does not lie on the curve.

14.**(C).**The figure is a parabola.C hoices (A),(D),and (E) do not represent parabolas.A n equation for a parabola should look som ething like this: $y = 5x^2 + 4x + 3$,w here the 5,4,and 3 can be other num bers.W hen the left side is just y,the right side has to have an x^2 term (and no higher pow er).There can be an x term and/or a constant term .

Both (B) and (C) represent parabolas, but the parabola in (B) is not centered on the y-axis (there must be no x term). The equation in (C), $y = x^2 - 2$, represents a parabola that opens upward, that is centered on the y-axis, and that has a y-intercept of -2. These features are consistent with the diagram.

15. **(E).** The standard equation of a parabola in vertex form is $y = a(x - h)^2 + k$, where the vertex is (h,k). Here is the vertex of the parabola described by each answer choice:

(A) (0,3) On the axis
(B) (3,3) Incorrect Quadrant
(C) (-3,-3) Incorrect Quadrant
(D) (3,-3) Incorrect Quadrant
(E) (-3,3) Correct

Only choice (E) places the vertex in the correct quadrant.

16. **(D).** The standard equation of a parabola in vertex form is $y = a(x - h)^2 + k$, where the vertex is (h,k). Eliminate choice (A), as it is not the equation of a parabola. Here is the vertex of the parabola described by each remaining answer choice:

(B) (0,1) Correct
(C) (0,-1) Incorrect
(D) (0,1) Correct
(E) (1,0) Incorrect

Both (B) and (D) have the correct vertex. However, choice (B) describes a parabola pointing upward from that vertex, because the x^2 term is positive. The negative in front of choice (D) indicates a parabola pointing downward from that vertex.

17. **25.** The equation of the parabola is $y = (x - h)^2 + k$. The standard equation of a parabola in vertex form is $y = a(x - h)^2 + k$, where the vertex is (h,k). (Since the equation of this particular parabola does not have constant a, a must be equal to 1.)

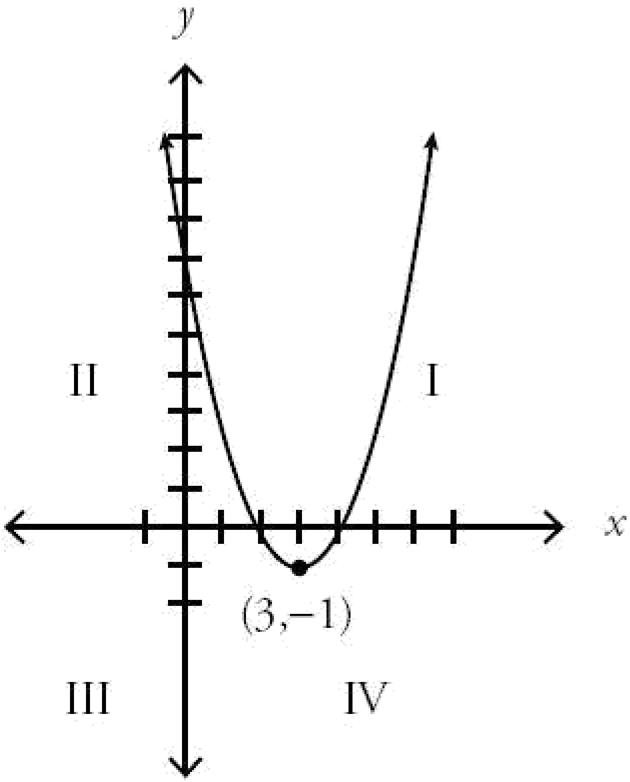
Using $y = (x - h)^2 + k$ and the vertex (2,0) shown in the graph:

$y = (x - 2)^2 +$
$0\ y = (x - 2)^2$

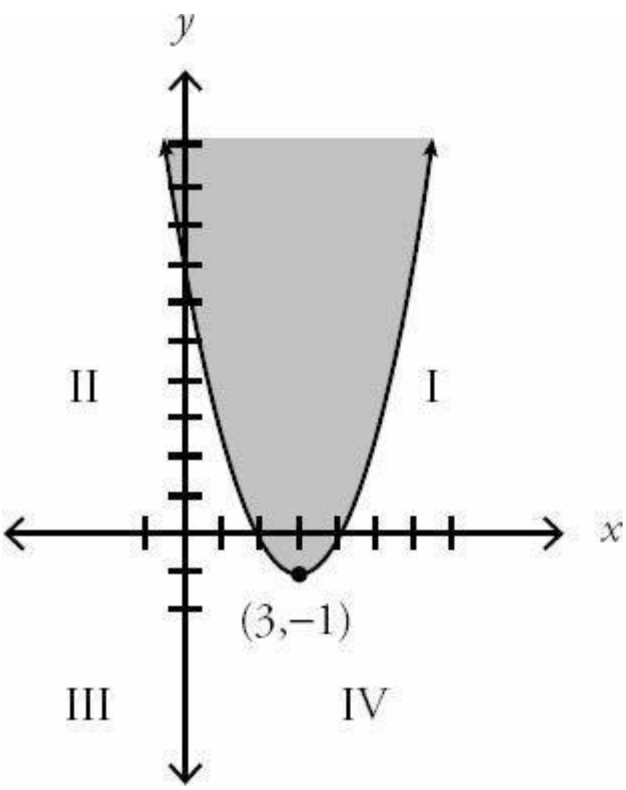
Since $(-3,n)$ is a point on the parabola, plug in -3 and n for x and y:

$n = (-3 - 2)^2$
$n = (-5)^2$
$n = 25$

18. **(C).** One method for solving this problem is to graph the curve. To do this, first graph the parabola as though the $\geq$ sign were an equals sign. The standard equation of a parabola in vertex form is $y = a(x - h)^2 + k$, where the vertex is (h, k). Thus, $y = (x - 3)^2 - 1$ is the graph of a parabola with its vertex at (3,-1). (3,1)



Since $y \geq (x - 3)^2 - 1$ is actually an inequality in w hich *y* (i.e.,all the *y*-coordinates) are greater than the graph,shade above the curve.



The inequality has no points in Q uadrant III.

A lternatively,you could use algebra to prove this.C oordinates in Q uadrant III have negative *x*-coordinates and negative *y*-coordinates.There is no such pair of coordinates that w ill satisfy $y \geq (x - 3)^2 - 1$.

Specifically,the only w ay the *y*-coordinate could be negative is if $(x - 3)^2$ w ere less than 1 (so that subtracting 1 from it yielded a negative).The only w ay for $(x - 3)^2$ to be less than 1 is for x to be less than 1 aw ay from 3.That is,y is only negative w hen $2 < x < 4$.Y ou can also dem onstrate this by setting $(x - 3)^2 - 1$ in an inequality w ith 0:

$(x - 3)^2 - 1 < 0 \longleftarrow$ N ote: this is N O T necessarily a true statem ent;you are investigating w hat w ould have to be true about x in order for this to be true.

$(x - 3)^2 < 1$
$x - 3 < 1$ or $x - 3 >$
$-1\ x < 4$ or $x > 2$
$2 < x < 4$

Thus,y is only negative w hen $2 < x < 4$.Therefore,no coordinate pair in Q uadrant III w ill satisfy the inequality.

19.**(A).**In slope intercept form ($y = m\,x + b$,w here m is the slope and b is the y-intercept):

$3y - 9x = 9$
$3y = 9x + 9$
$y = 3x + 3$

The slope is 3.The y-intercept is also 3,but the problem asks for the x-intercept.To get an x-intercept,substitute 0 for y:

$0 = 3x +$
$3 -3 = 3x$
$-1 = x$

Thus,the slope is 3 and the x-intercept is -1.Q uantity A is greater.

20.**5.**If l_1 and l_2 intersect at (2,4),then 2 can be plugged in for x and 4 plugged in for y in either equation.Equation l_1:

$y = px + 16$
$4 = p(2) +$
$16 -12 = 2p$
$-6 = p$

N ow ,plug (2,4) as w ell as $p = -6$ into Equation l_2 to get m ,the final answ er:

$y = m\,x + p$
$4 = m\,(2) - 6$
$10 = 2m$
$5 = m$

21.**I and III only.**To be on the sam e line as (3,5) and (4,9),the slope betw een any given point and either (3,5) or (4, 9) m ust be the sam e as the slope betw een (3,5) and (4,9).

The (very) long w ay to do this problem w ould be to find the slope of (3,5) and (4,9).U sing “change in y” divided by “change in x,” you get a slope of 4/1,or 4.Test the choice (2,1) w ith either (3,5) or (4,9) to see if the slope is the sam e — for instance,the slope of the line segm ent betw een (2,1) and (3,5) is clearly 4/1,since the difference betw een the *y*-coordinates is 4 and the difference betw een the *x*-coordinates is 1.Since the slopes of these connecting line segm ents are the sam e,they are in fact parts of the sam e line.

It is possible to do this procedure for each choice.H ow ever,like m ost G R E problem s,this problem has a “trick”: U sing the original tw o points,notice that to get from (3,5) to (4,9),the *x*-coordinate goes up 1,w hile the *y*-coordinate goes up 4.N ow just continue that pattern upw ard from (4,9),adding 1 to the *x* and 4 to the *y*.Y ou get (4 + **1**,9 + **4**),or (5,13).This point is not in the choices,and in fact you can now elim inate (5,12) since the line passes above that point.

K eep going up on the line.(5 + **1**,13 + **4**) is (6,17),so this point is on the line.

Y ou can do the sam e trick going *dow n*.Start from (3,5) and instead of adding 1 and 4,*subtract* 1 and 4.(3 - **1**,5 - **4**) is (2,1),so this point is on the line.

Thus,(2,1) and (6,17) are on the line,and (5,12) is not.

22.**(A).**If the slope of line *l* is > 1 and line *p* is perpendicular (you know this because of the right angle sym bol on the figure),then line *p* w ill have a slope greater than -1 because perpendicular lines have negative reciprocal slopes— that is,the product of the tw o slopes is -1.

Try a few exam ples to better illustrate this: line *l* could have slope 2,in w hich case line *p* w ould have slope -1/2.Line *l* could have slope 3/2,in w hich case line *p* w ould have slope -2/3.O r,line *l* could have slope 100,in w hich case line *p* w ould have slope -1/100.

A ll of these values (-1/2,-2/3,and -1/100) are greater than -1.This w ill w ork w ith any exam ple you try;since line *l* has a slope greater than 1,line *p* w ill have a slope w ith an absolute value less than 1.Since that value w ill also be negative,it w ill alw ays be the case that -1 < (slope of line *p*) < 0.

23.**(D).**Since lines l_1 and l_2 are parallel,they have the sam e slope.C all that slope *m* .Since the slopes add to less than 1:

$$m + m < 1$$
$$2m < 1$$
$$m < 1/2$$

Thus,lines l_1 and l_2 each have slopes less than 1/2.A line perpendicular to those lines w ould have a negative reciprocal slope.H ow ever,there isn't m uch m ore you can do here.Lines l_1 and l_2 could have slopes of 1/4 (in w hich case a perpendicular line w ould have slope = -4),or slopes of -100 (in w hich case a perpendicular line w ould have slope = 1/100).Thus,the slope of the perpendicular line could be less than or greater than $-\frac{1}{2}$.

24.**(B).**Y ou are told that the slope is 1/3.Since slope = rise/run (or “change in *y*” divided by “change in *x*”),for every 1 unit the line m oves up,it w ill m ove 3 units to the right.

Since the *actual* m ove to the right is equal to 4,you can now create a proportion:

$$\frac{1}{3} = \frac{n}{4}$$

H ere, n is the distance from *A* to *B* (w hich is also the change in the *y*-coordinates).

C ross m ultiply to get $3n = 4$ or $n = 4/3$.

25. **(E).** The slope form ula is $m = \frac{y_2 - y_1}{x_2 - x_1}$. U sing $\frac{15}{14}$ as the slope, (-6, *y*) as x_1 and y_1, and (-1,4) as x_2 and y_2:

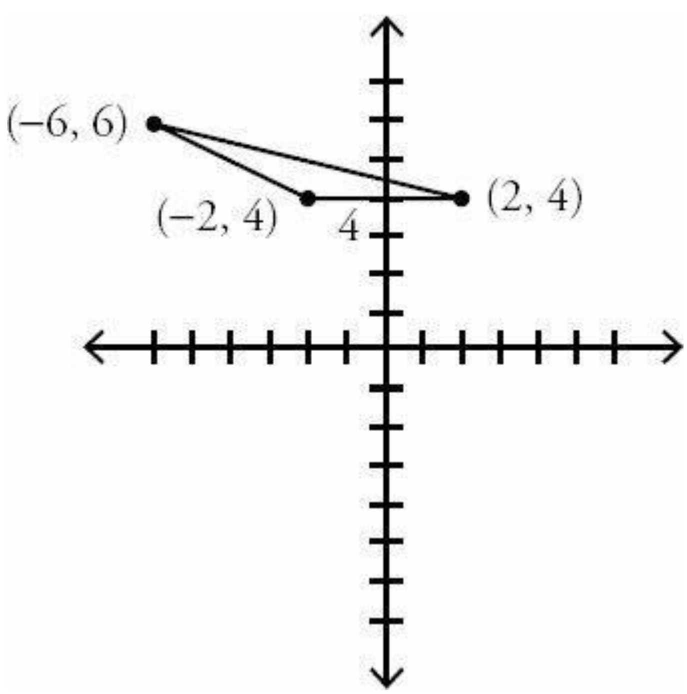
$$\frac{15}{14} = \frac{4 - y}{-1 - (-6)}$$

$$\frac{15}{14} = \frac{4 - y}{5}$$

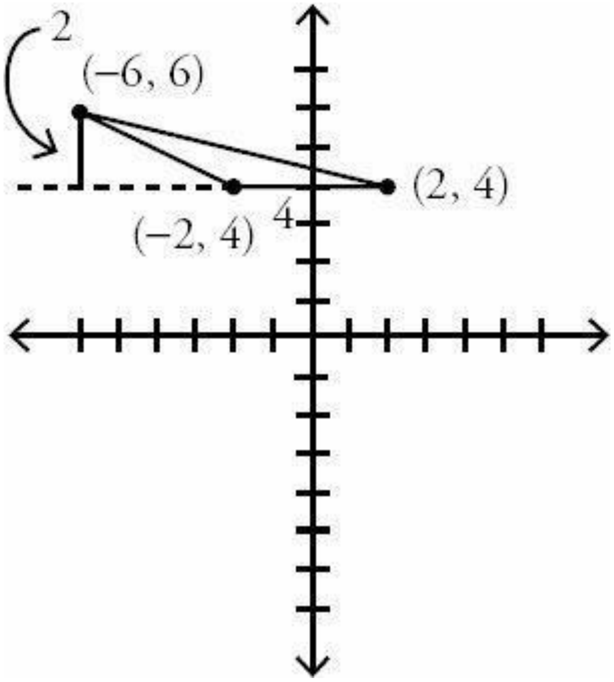
C ross m ultiply and solve for *y*:

$15(5) = 14(4 - y)$
$75 = 56 - 14y$
$19 = -14y$
$-\frac{19}{14} = y$

26. **4.** M ake a quick sketch of the three points, joining them to m ake a triangle. Since (-2,4) and (2,4) m ake a horizontal line, use this line as the base. Since these tw o points share a *y*-coordinate, the distance betw een them is sim ply the distance betw een their *x*-coordinates: 2 - (-2) = 4.



The height of a triangle is alw ays perpendicular to the base.D rop a height vertically from (-6,6).Subtract the y-coordinates to get the distance: 6 - 4 = 2.

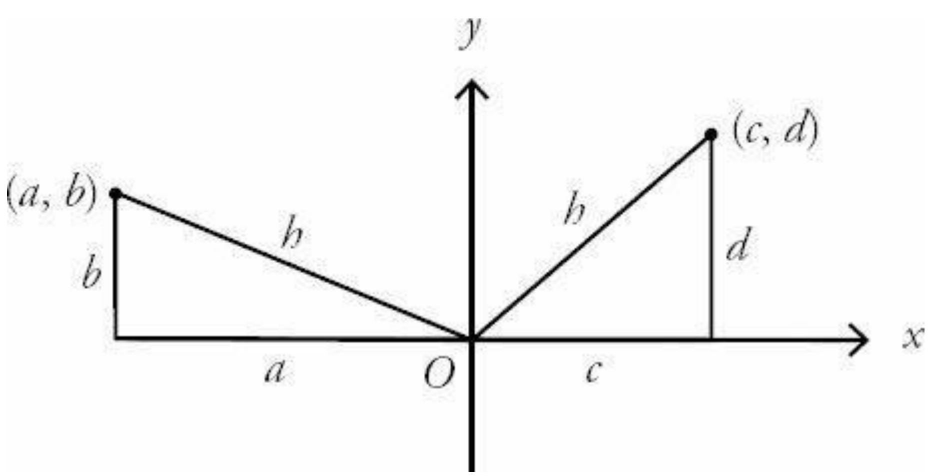


The form ula for area of a triangle is $\frac{bh}{2}$.Thus,the area is $\frac{(4)(2)}{2}$,or 4.

27.**(B).**The slopes of perpendicular lines are the negative inverse of each other,so their product is -1.For exam ple, perpendicular lines could have slopes of 2 and -1/2,or -5/7 and 7/5.In all of these cases,Q uantity A is equal to -1. (The only exception is w hen one of the lines has an undefined slope because it’s vertical,but that case has been specifically excluded.)

If line *p* passes through the origin,its *y*-intercept is 0,so regardless of the *y*-intercept of line *k*,Q uantity B is equal to zero.

28.**(B).**A point’s distance from the origin can be calculated by constructing a right triangle in w hich the legs are the vertical and horizontal distances.Sketch a diagram in w hich you place (*a*,*b*) and (*c*,*d*) anyw here in the coordinate plane that you w ish;then construct tw o right triangles using (0,0) as a vertex.



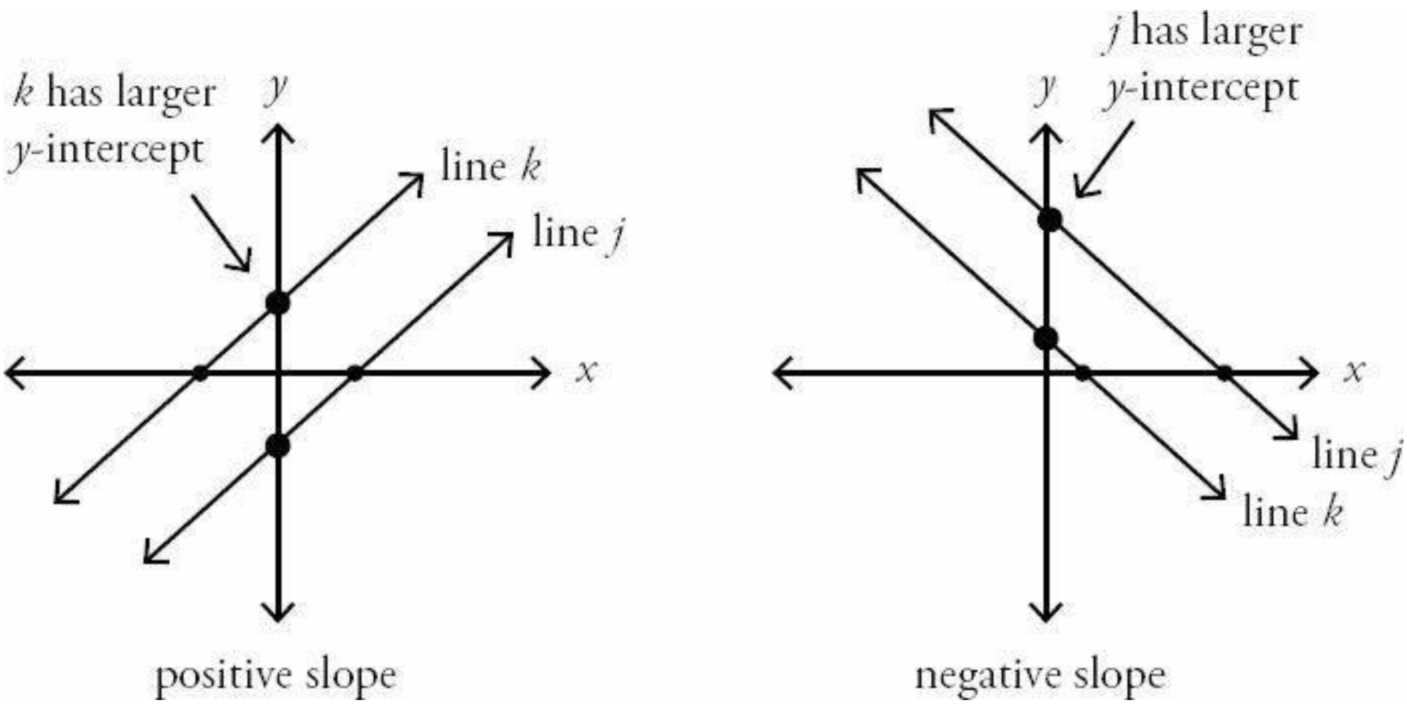
B oth hypotenuses are labeled *h*,since the points are equidistant from the origin.Set up tw o Pythagorean theorem s:

$a^2 + b^2 = h^2$
$c^2 + d^2 = h^2$

So $a^2 + b^2 = c^2 + d^2$.

Since $|a| > |c|$, you know that $a^2 > c^2$. (Try it w ith test num bers.) To m ake the equation $a^2 + b^2 = c^2 + d^2$ true, you m ust have $b^2 < d^2$. This m eans that $|b| < |d|$, and Q uantity B is larger.

29. **(D).** Parallel lines have the sam e slope. Since the product of the tw o slopes is positive, either both slopes are positive or both slopes are negative. H ere are tw o exam ples in w hich line *j* has a larger *x*-intercept, as specified by the problem :



If the slopes are positive, *k* w ill have the greater *y*-intercept, but if the slopes are negative, *l* w ill have the greater *y*-intercept.

30. **I and III only.** Statem ent I tells you directly that *b*, the *y*-intercept, is equal to 0. Thus, the line passes through the origin.

For statem ent II, both the slope and the *y*-intercept could be 0, in w hich case line *z* is a horizontal line lying on the *x*-axis and therefore passes through the origin. O r, the slope and *y*-intercept could sim ply be opposites, such as 2 and -2. A line w ith a *y*-intercept of -2 and a slope of 2 w ould not pass through the origin. Therefore, this statem ent is not sufficient to determ ine w hether line *z* passes through the origin.

As for statem ent III, since $|a| = |b|$ m ust hold for every point on the line, then (0,0) is a point on the line, since $|0| = |0|$.

31. **(C).** B oth figures share triangle *M LK*, so you don't need to calculate anything for this part of the figure. Parallelogram *K LM N* and quadrilateral *JK LM* each have a "top" (the part above the *x*-axis) that is a triangle w ith base *M K* (= 8) and height 5. If tw o triangles have the sam e base and equal heights, their areas are equal. N o calculation is needed to pick (C).

32.**(C).**R earrange the equation to get it into $y = mx + b$ form at w here m is the slope:

$5x - 6y = 9$ -
$6y = -5x + 9$
$$y = \frac{5}{6}x - \frac{3}{2}$$

The slope is $\frac{5}{6}$.Parallel lines have the sam e slope,so only choice (C) is parallel to the given line.

33.**(A)**.The line $y = -6x + 4$ is already in $y = mx + b$ form at,so the slope is -6.Perpendicular lines have negative reciprocal slopes,so you are looking for a line w ith slope $\frac{1}{6}$.R earrange each choice into $y = mx + b$ form at,if needed,to find a m atch.

C hoice (A):

$6y - x = 12$
$6y = x + 12$
$y = \frac{1}{6}x + 2$

The slope of this line is $\frac{1}{6}$.C hoice (A) w orks,so it is not necessary to try the other choices.